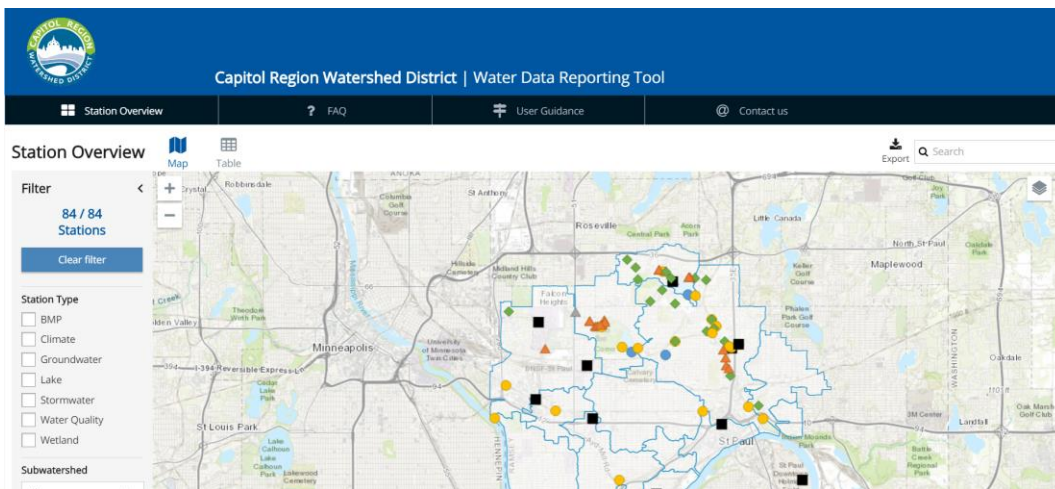




# MONITORING PROGRAM EVOLUTION: IMPROVING EFFICIENCY, ACCURACY, AND CONSISTENCY

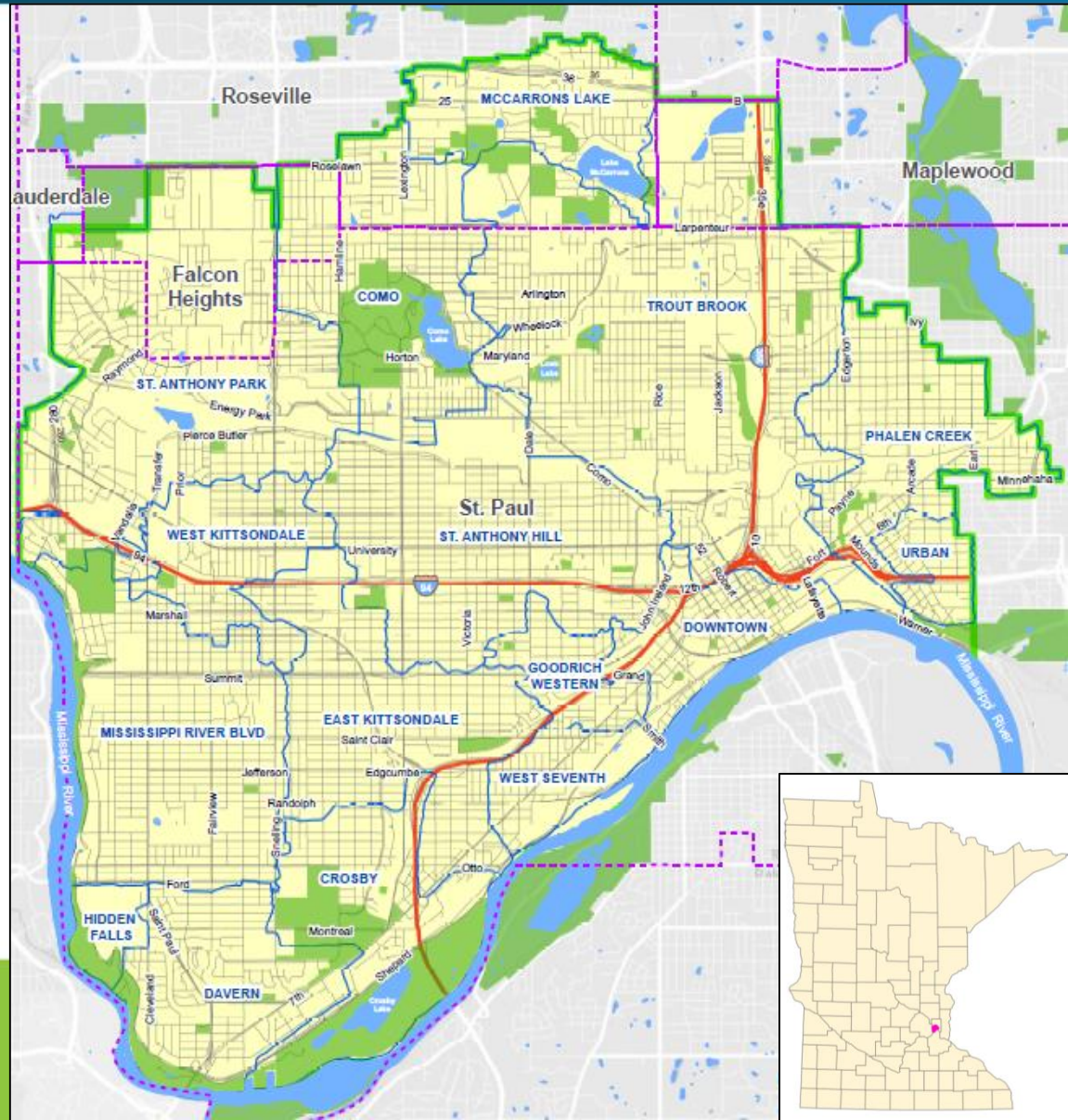
JOE SELLNER  
Water Resource Specialist

MARCH 28, 2019



# Capitol Region Watershed District

- St. Paul, Minnesota
- Local unit of gov't
- Drainage area: **41 mi<sup>2</sup>**
  - 5 lakes
  - 13 mi. of Mississippi
  - Storm sewer network
- Highly urbanized
  - **42%+** impervious
  - Population: **245,000**
- 14-yr monitoring program foundation of CRWD





# CRWD Monitoring Dataset

- Over **115** stations since 2005:
  - Data types:
    - Discrete (Lakes, Wetlands, Precip, WQ)
    - Continuous (Level, Velocity, Discharge)
    - Qualitative (Wetlands)
  - 14 seasons of monitoring data
    - Millions of data points
- Dataset continues to grow!



# Monitoring Program Evolution

2005



2014



2019

Collect Baseline Data

Improve Monitoring Techniques

Project and Performance Monitoring

Expand Scope of Monitoring

Program Review

Increase Efficiency, Streamline Data Management, Expand Analysis



# 2014 Program Review

- What do we do well?
- Why monitor in CRWD?
- How can our monitoring data be used in other CRWD programs?
- Who are the audiences for our data?
- What do our audiences need to effectively make use of our data?
- Who are potential new monitoring program partners who could strengthen our work?
- What changes can we make to improve the *efficiency* of our data collection?
- To best use our finite resources, where are areas we could reduce or eliminate collection efforts?
- Is there anything that should be *added* to the program?



# 2014 Program Review

## Impediments:

### 1. Staff time

- Routine field activities take too much time

### 2. Data management

- Lack of good solution for organization, processing, and access

*Staff knowledge and skills not fully  
being put to use*



# Improvement Areas

1. Data Management
2. Monitoring Efficiency and Reliability
3. Reporting
4. Monitoring Planning



# 1. Data Management





# Data Management Issues

- **Lots of data!**
  - Historically organized in Excel Files
- **Issues:**
  - Data fragmentation-- no data continuity
  - Inconsistency between years
  - Limited data processing/QAQC capabilities
  - Data sharing difficulties
- **Overall, data management time consuming & inefficient**
- **Needed a data management solution to improve:**

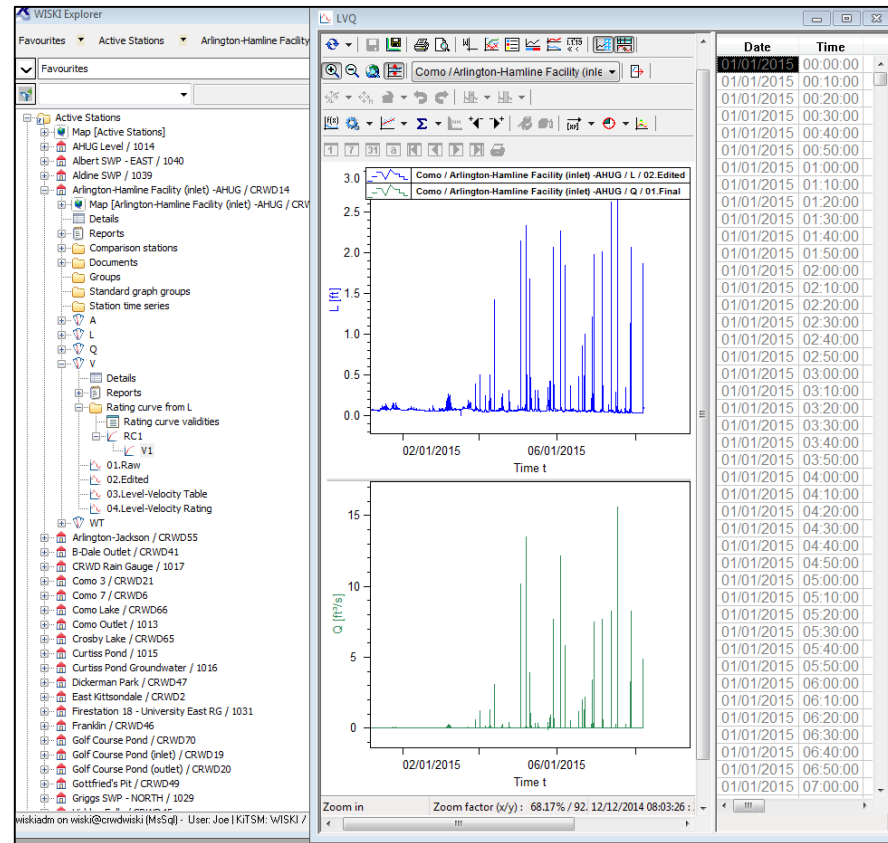


***Efficiency, Consistency, Accuracy***

# Kisters WISKI

## Water Data Management Software

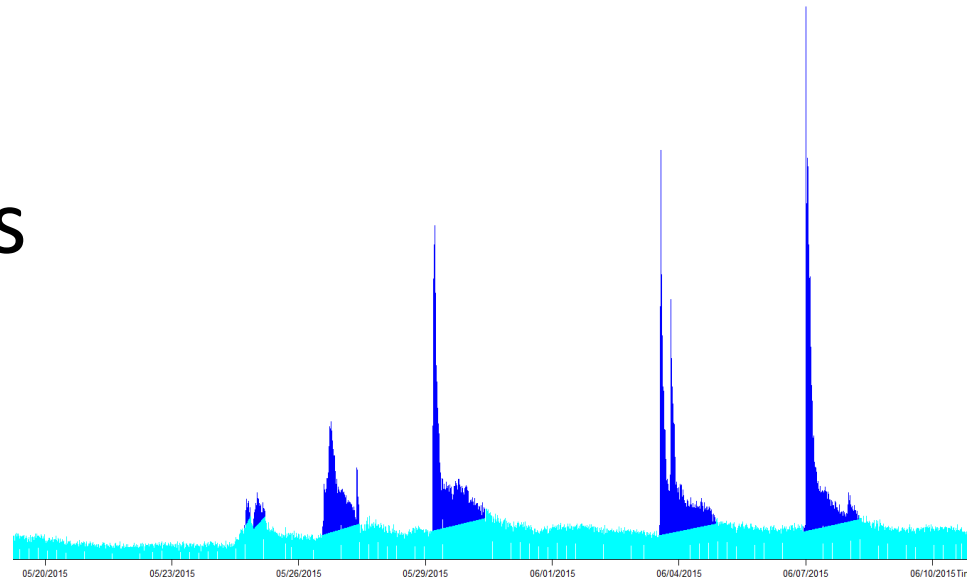
- Continuous & discrete data
- Data analysis
- Data editing
- Data processing



# Automation

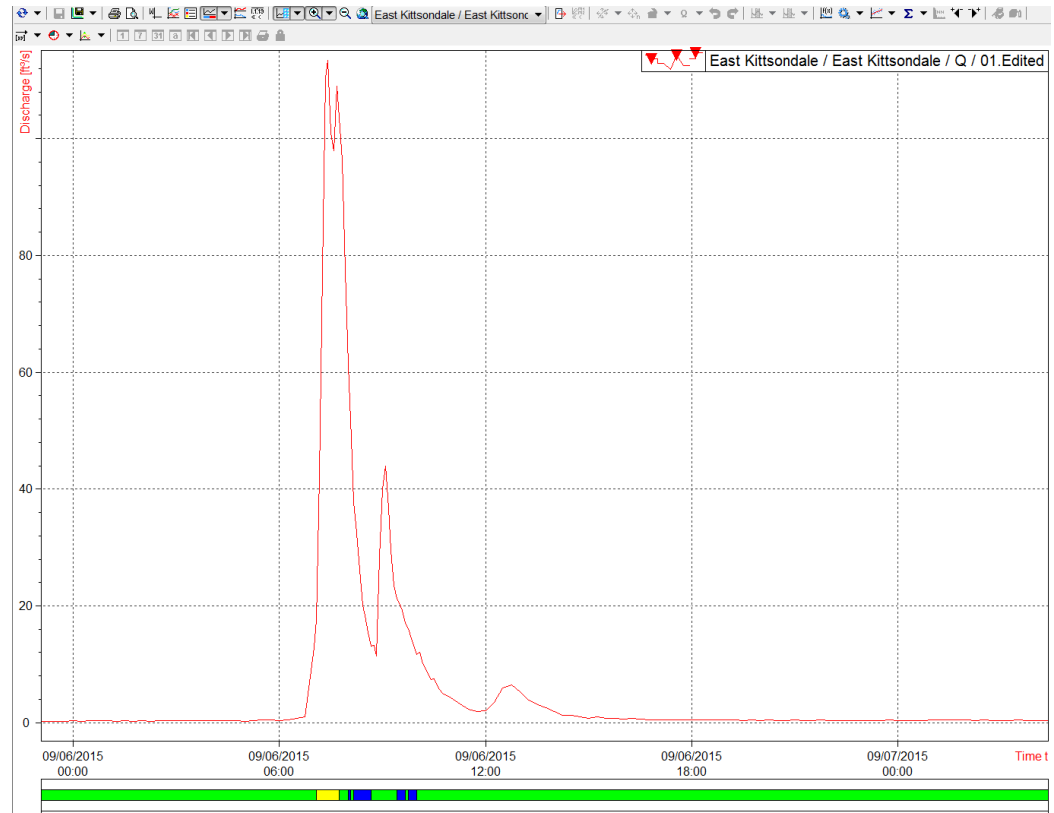
## Converted from Excel:

- Baseflow/event flow separation
- Baseflow totals
- Event flow totals
- Loads
- Statistics



# Improved Workflow

- Data editing and edit tracking
- Quality coding
- On-the-fly calculations aid analysis





## 2. Monitoring Efficiency & Reliability



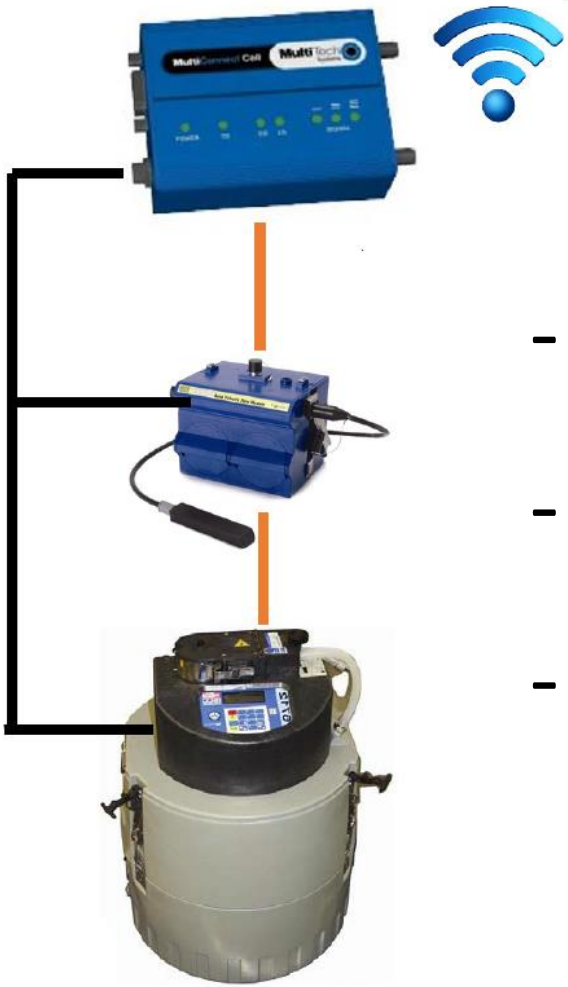
# Reliable Power



Solar or AC power installed at stormwater stations

- Eliminated need for frequent battery changes
- Less data loss due to power failure

# Telemetry



- Automated Data Import
- Remote Programming
- Station Data and Sampler Status

# Asset Management

- Location tracking
- Repair history
- Equipment age

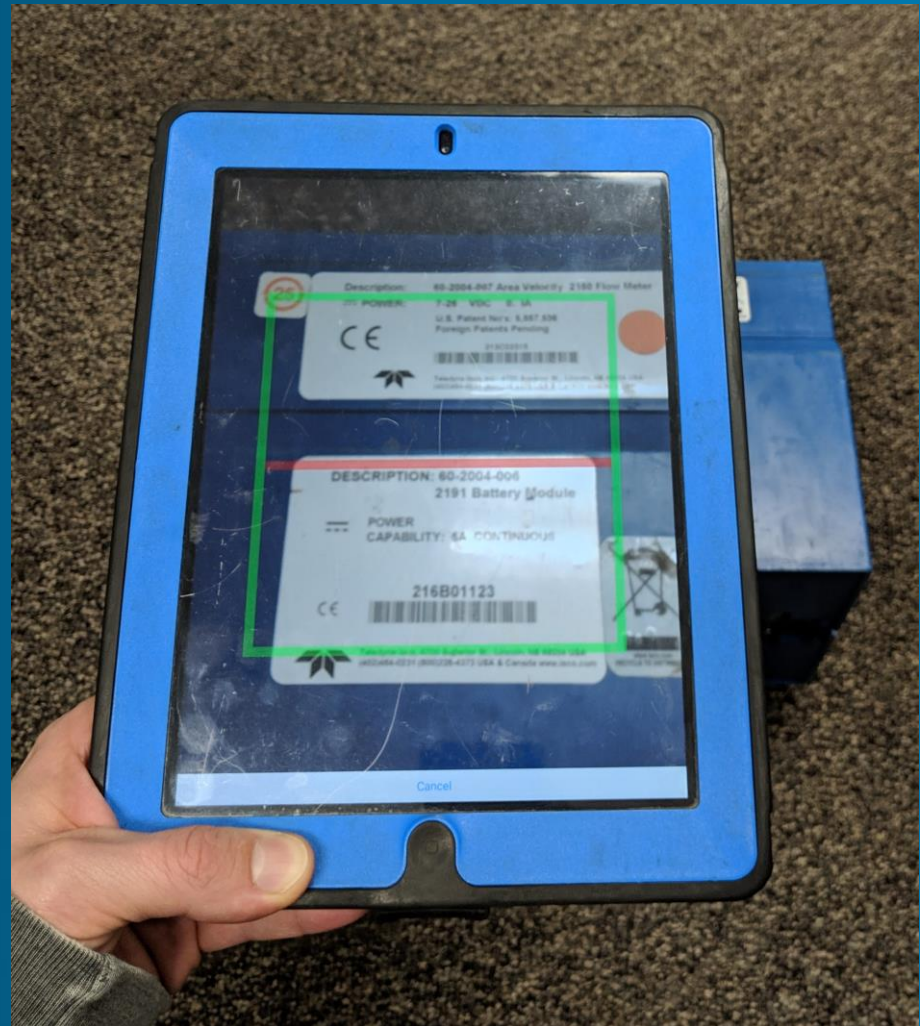
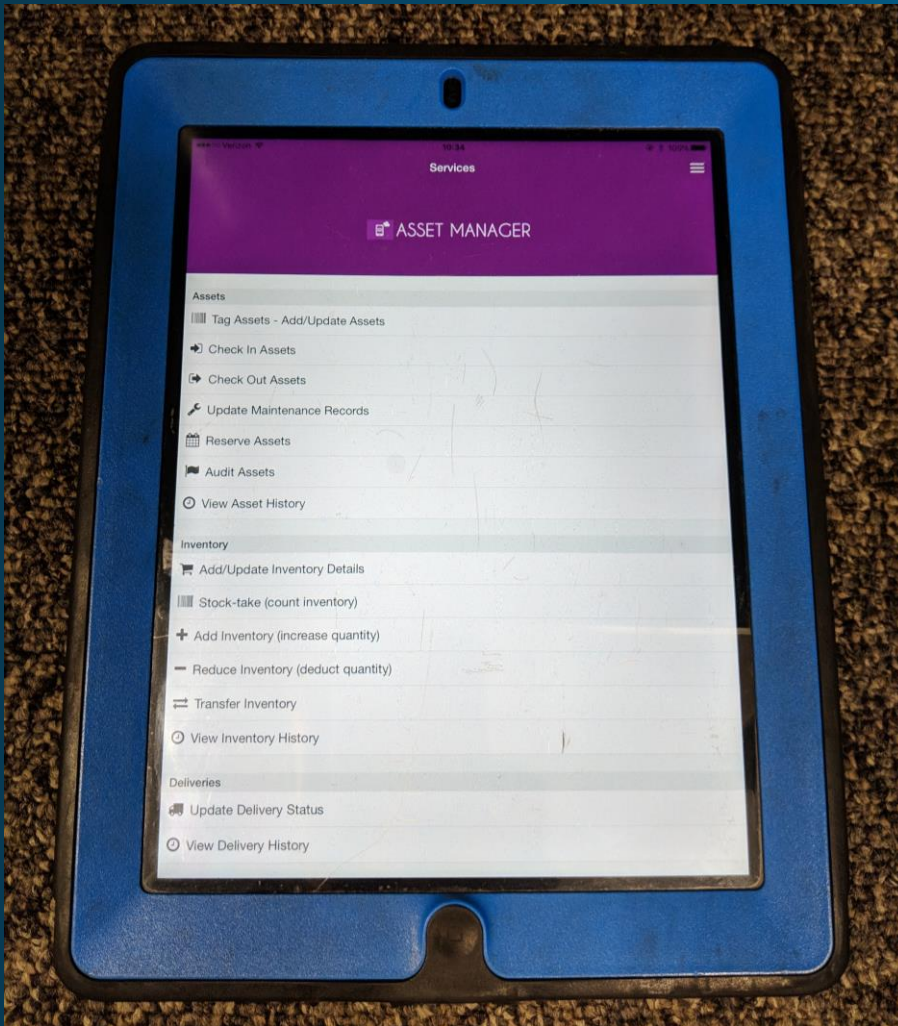
*Increased Reliability*

The screenshot displays the 'ASSET MANAGER' web application. The interface includes a sidebar with navigation options: 'Manage Assets', 'Smartphone App', 'Bluetooth & USB Scanners', 'Data Capture', 'Documents', 'Barcodes & NFC Tags', 'Apps', and 'Help'. The main content area is titled 'Manage Assets' and features four action buttons: 'Use A Scanner', 'Add Manually', 'Import From CSV', and 'Scan to Spreadsheet'. Below these buttons is a table of assets with columns for Image, Barcode, Asset Name, Last Activity, Asset Type, Serial, and Maintenance. The table lists four assets: a Genasun GV-5 Solar Controller, a Hobo Waterproof Shuttle U-DTW-1, an Onset Hobo Conductivity Logger, and an Onset Hobo Water Level Logger. A search bar and a 'Show 100 entries' dropdown are located above the table. The top right corner shows a user profile for 'CRWD Monitoring'.

	Image	Barcode...	Asset Name	Last Activity	Asset Type	Serial ...	Mainten...
<input type="checkbox"/>		087158	Genasun GV-5 Solar Controller	Tagged		087158	
<input type="checkbox"/>		10025122	Hobo Waterproof Shuttle U-DTW-1	Tagged	Onset Hobo Shuttle	10025122	
<input type="checkbox"/>		10086795	Onset Hobo Conductivity Logger	Tagged	Onset Hobo Conductivity Logger	10086795	
<input type="checkbox"/>		10146498	Onset Hobo Water Level Logger	Tagged	Onset Hobo Level Logger	10146498	







<https://ai.ventipix.com/>

# Quality Assurance Program Plan

- Defines quality assurance goals and procedures
- Summarizes the monitoring program design, sampling methods, analytical procedures, and data review protocols.



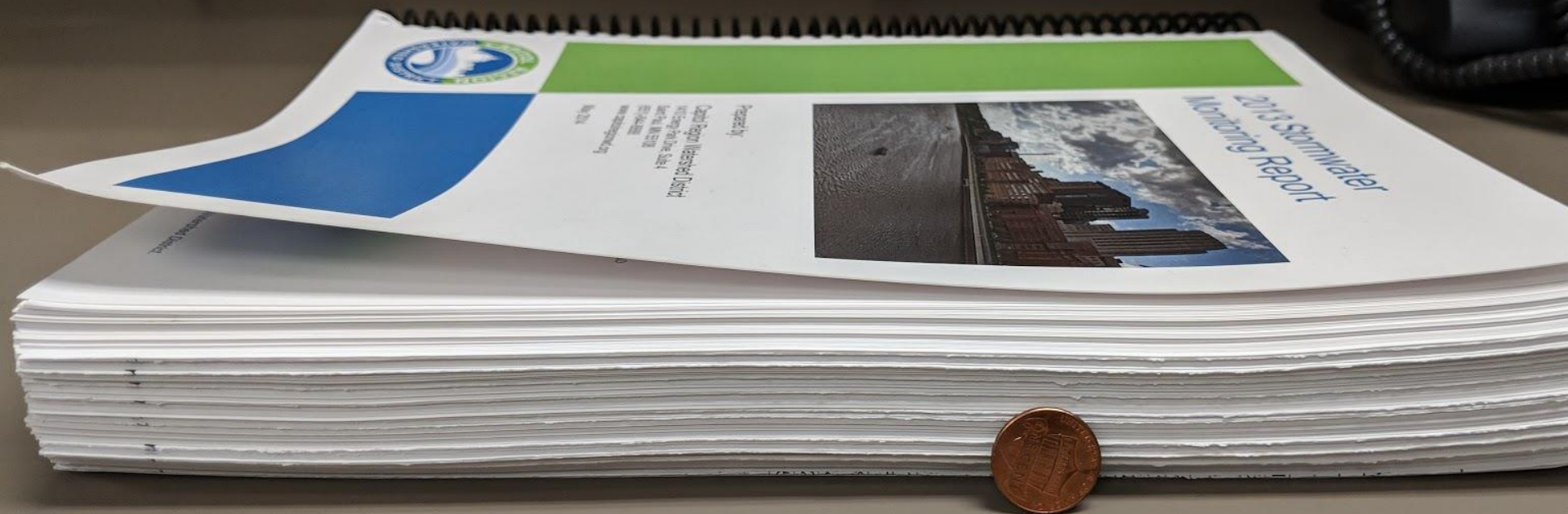
# Quality Assurance Objectives

- 1) Precision**
- 2) Accuracy**
- 3) Representativeness**
- 4) Completeness**
- 5) Comparability**
- 6) Analytical Sensitivity**

# 3. Reporting







Presented by  
Carol Lynn Hester, Director  
Stormwater Management  
Department  
City of Boston  
www.cityofboston.gov  
July 2013



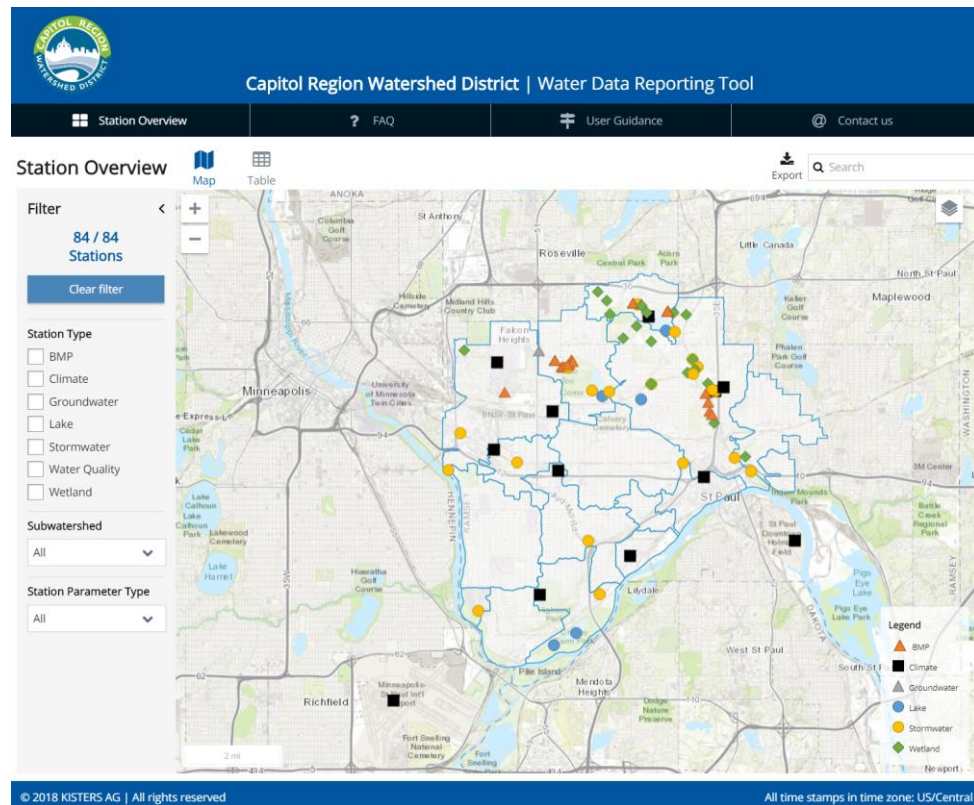
## 2013 Stormwater Monitoring Report



# User-driven Data Delivery

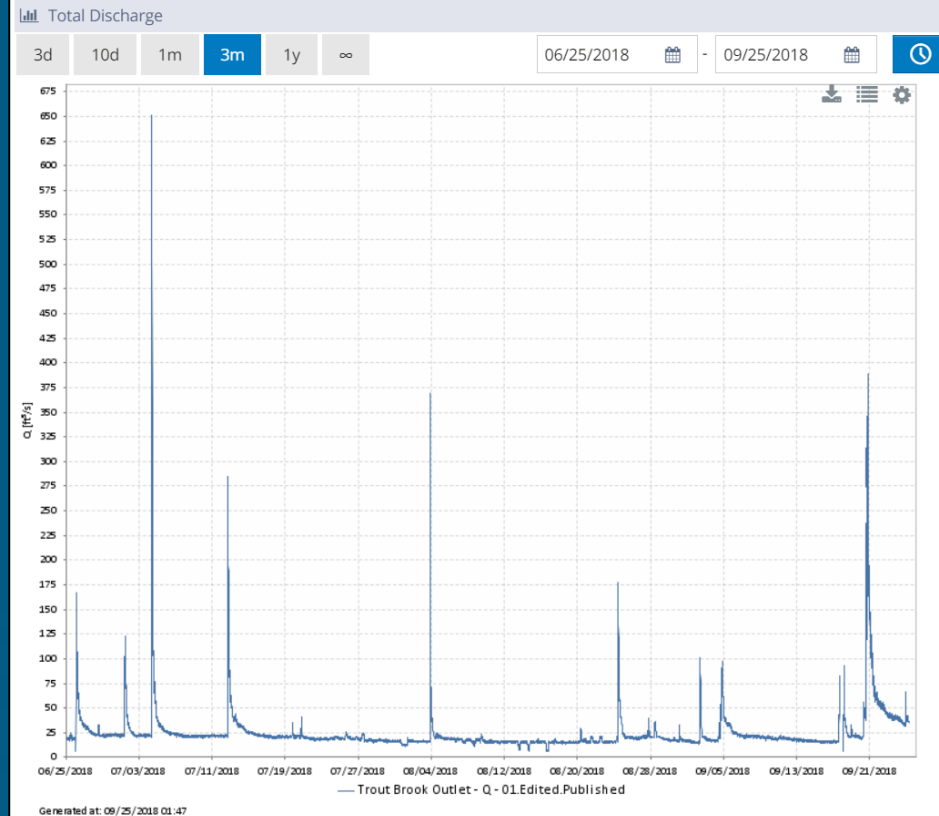
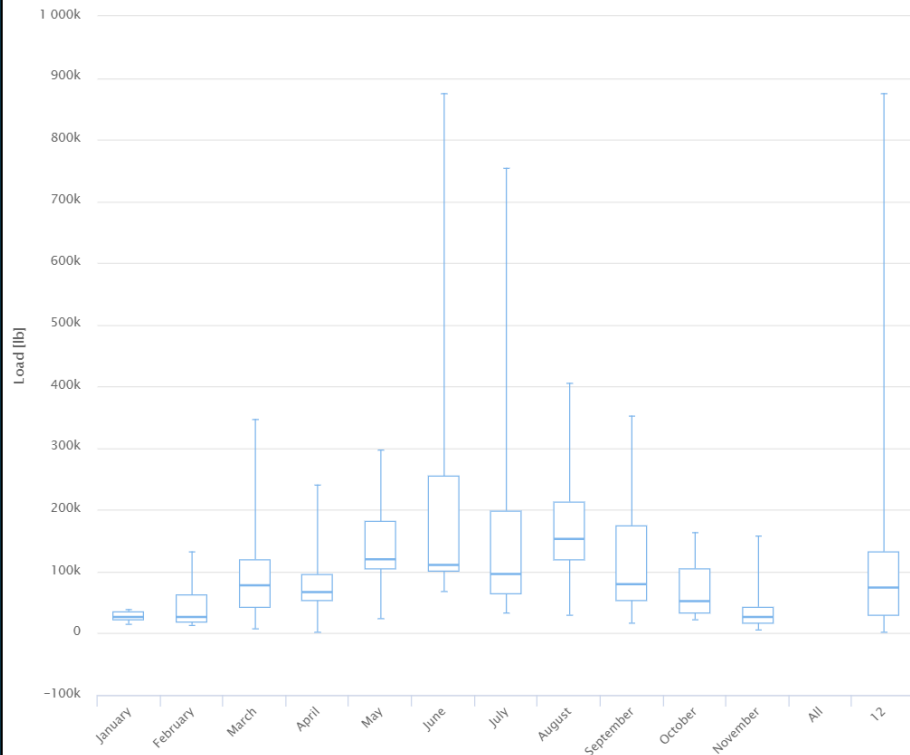
<http://waterdata.capitolregionwd.org>

- Visualization
- Statistics
- Data access



# Water Data Reporting Tool

Statistical analysis for Trout Brook Outlet



# 4. Monitoring Planning





# Monitoring Philosophy

- Make sure monitoring has a purpose.
- Ensure site selection, sampling frequency, monitoring goals all fit with purpose
- Analyze and put data to use
- Report and share data

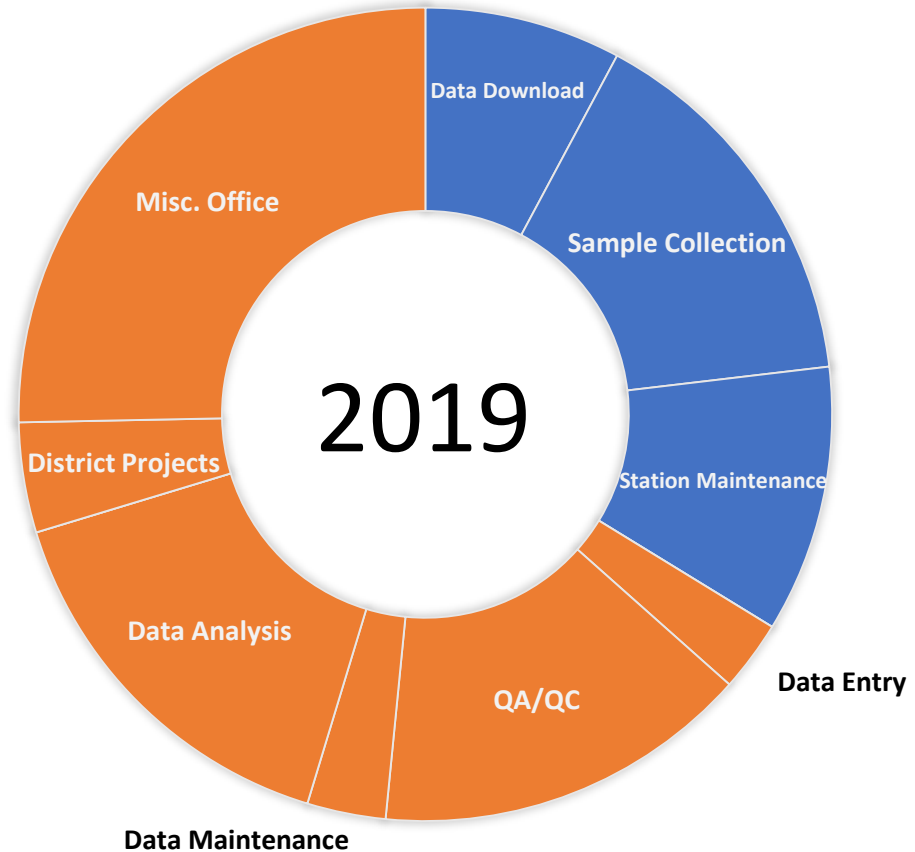
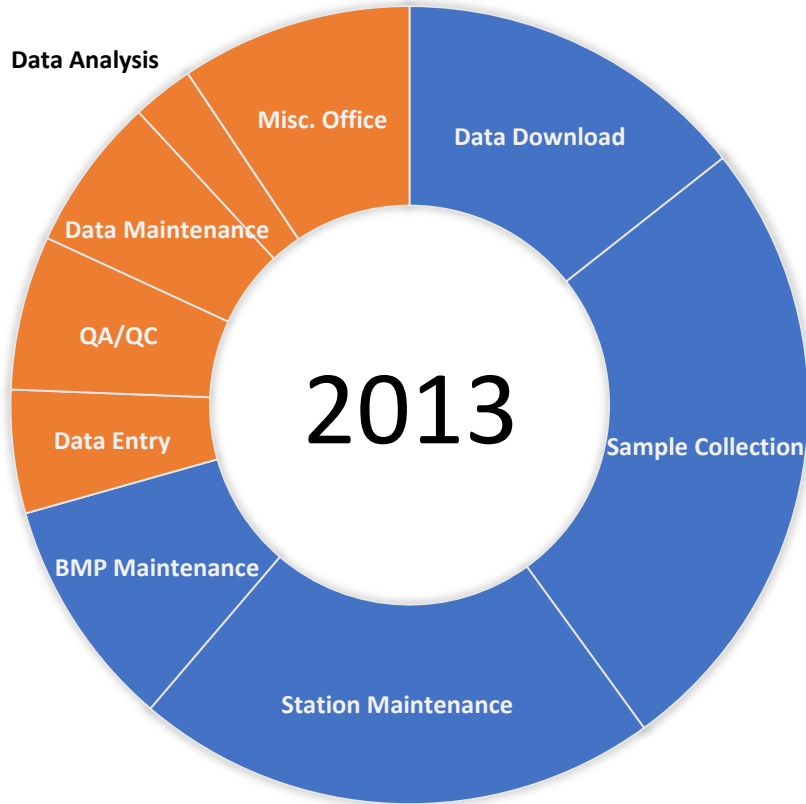


# 2019 Monitoring Program

- Streamlined field work, data management, reporting
- Support and initiate District projects
- More analysis of collected data



# Monitoring Technician Tasks



Office Tasks



Field Tasks





# Successes, Setbacks, Lessons Learned

1. All transitions have hiccups – expect them
2. Every organization is different
3. Take advantage of your staff's strengths
4. Take time for real self-reflection
5. Up-front costs can seem daunting, but increases in productivity and efficiency are worth it





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[www.capitolregionwd.org](http://www.capitolregionwd.org)